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AUTHOR Hood, Paul D.
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ABSTRACT

Knowledge production and utilization (KPU) involves the communication and transfer technology of a discipline. In education as in other areas, the problems with KPU are due to (a) a lack of common language or frame of reference, (b) the sudden vast amount of research, and (c) the lack of a firm knowledge based on educational knowledge utilization. Given the newness of the effort and the many perspectives that may be taken, difficulties exist in sorting out systems levels--roles, relationships, and activities--among producers, diffusers, and consumers of education. However, knowledge and technology production is located in all the above systems levels, and is moved by three types of transfers: (a) those within the confines of the specific user system itself; (b) by direct horizontal or indirect vertical transfers from one user system to another; or (c) by transfers directly from specialized resource systems or indirectly through mediating systems. Two information networks, the research and development (R&D) network, and the practice improvement network, utilize these methods of transfer. However, successful installation of these networks into an organization involves changing structure, technology, or people's behaviors. Consequently, utilizing these methods in research, development, disseminaton, and evaluation (RDD&E) is difficult, costly, and risky; although it is still being undertaken by a great variety of education organizations. (Illustrations on change approaches, systems development, and transfers are included.) (JS)

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SIMILARITIES AND DIFFERENCES AMONG AND BETWEEN PRODUCERS, DIFFUSERS, AND CONSUMERS OF RESEARCH: THE NEED FOR COMMUNICATION

Paul D. Hood

Far West Laboratory
for
Educational Research and Development

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
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When I agreed to deal with the subject of communication, I had anticipated dealing with a different topic from the one that now seems pertinent. Earlier I thought it would be helpful to take a hard look at communication among people in the R&D system and in the educational practice system, as well as at the communication between these two systems. However, Doug Paul's paper has provoked me to reorganize substantially, since I am impressed with the case he makes regarding a more immediate problem--our difficulties in communicating with each other about "research utilization." I find Doug's conceptual framework for categorizing knowledge utilization research stimulating, but I am not especially comfortable with parts of it. Consequently I would like to spend my time "piggy-backing" on what Doug has offered us.

For this purpose, it may be helpful to lay some groundwork. My first observation is that we are experiencing severe concept and language problems. Part of this problem in communication may be due to the fact that we don't as yet have a sufficiently common language or a common frame of reference. And I suspect a corollary is that we are sometimes talking about quite different things without quite realizing what is happening. Moreover, each of us, coming from quite different experiences, has learned to make important differentiations in his own concepts and understandings, but each may be quite unable to sense the nuances of someone else's observations. This is somewhat comparable to the Eskimo who have many different words for snow and for reindeer, but hardly a word to cover the various models of automobiles that are so richly discriminated in advertising copy in our culture.

Currently the most inclusive term for our general field of inquiry may be Knowledge Production and Utilization (KPU). But we also have many subordinate terms such as dissemination, diffusion, implementation, marketing, linking,

change, local problem solving, renewal, technology transfer, and so on. Plus an almost bewildering array of models, paradigms, strategies and tactics, assumptions, instruments, and methodologies that have been imported from other fields and disciplines, or that have been home-grown in the educational domain.

It may be useful to remind ourselves that this apparently chaotic state of knowledge is symptomatic of the very recent intense interest in educational KPU, an interest that, in turn, is most easily explained by the relatively recent history of substantial funding for educational innovation, research, and development. Certainly, only in the past few years have we been simultaneously confronted with validated products or practices worth diffusing and installing, with the resources to accomplish such undertakings on even a limited scale, and with some truly significant and concerned interest from our sponsors and colleagues that we succeed in the effort.

My third point is that we really do not yet have a firm knowledge base about educational knowledge utilization or educational diffusion. In my view, educational diffusion may become the Achilles' heel of the entire educational research, development, and evaluation enterprise. Despite the accumulation of an impressive body of literature with regard to diffusion, relatively few studies tell us how diffusion actually occurs or what specific knowledges or skills are essential for adequate performance of diffusion roles. If the reason for investment in RD&E is practice improvement, then we must make a major effort to study, understand, and develop a more effective diffusion capability.

Fortunately, there is now both the interest and the intent--at NIE and USOE and in the field--to begin to strengthen our diffusion capability, and also to use disciplined inquiry to find additional ways to improve that capability.

With these preliminary comments, I want to turn to Doug Paul's framework and offer some ideas for improving it in terms of a multi-dimensional scheme that may help us find an organizing perspective.

At the outset I think it may be helpful to list and briefly comment on several dimensions, which we shall return to later. These are listed in Figure 1.

[SHOW FIGURE 1]

I have found the distinction of vertical vs. horizontal transfer of knowledge to be immensely useful in understanding why communication and technology transfer seems so inefficient in education when contrasted to other areas.

[SHOW FIGURE 2]

This figure, in a simplified way, identifies some of the participants and the flows of knowledge among participants at similar or different levels of expertise. Bill Paisley has observed that perhaps in only one other field, public health, is the distinction between horizontal and vertical knowledge flow as significant as in education, for these two fields are perhaps unique in having deeply stratified audiences for information.

Beginning with small groups of equally expert researchers we move primarily horizontally to researchers in source and derivative fields, then down a step to the non-researching professors and consultants who stay fairly close to the forward edge of the field and finally to graduate students working to develop expertise in the field. Also located in the R&D network are the relative newcomers--the educational RDD&E personnel who draw on knowledge and technology from a variety of disciplines and fields. Below all these participants in the R&D network, but much closer to the reality of the practice of education, are the

FIGURE 1

VERTICAL vs. HORIZONTAL KNOWLEDGE TRANSFER

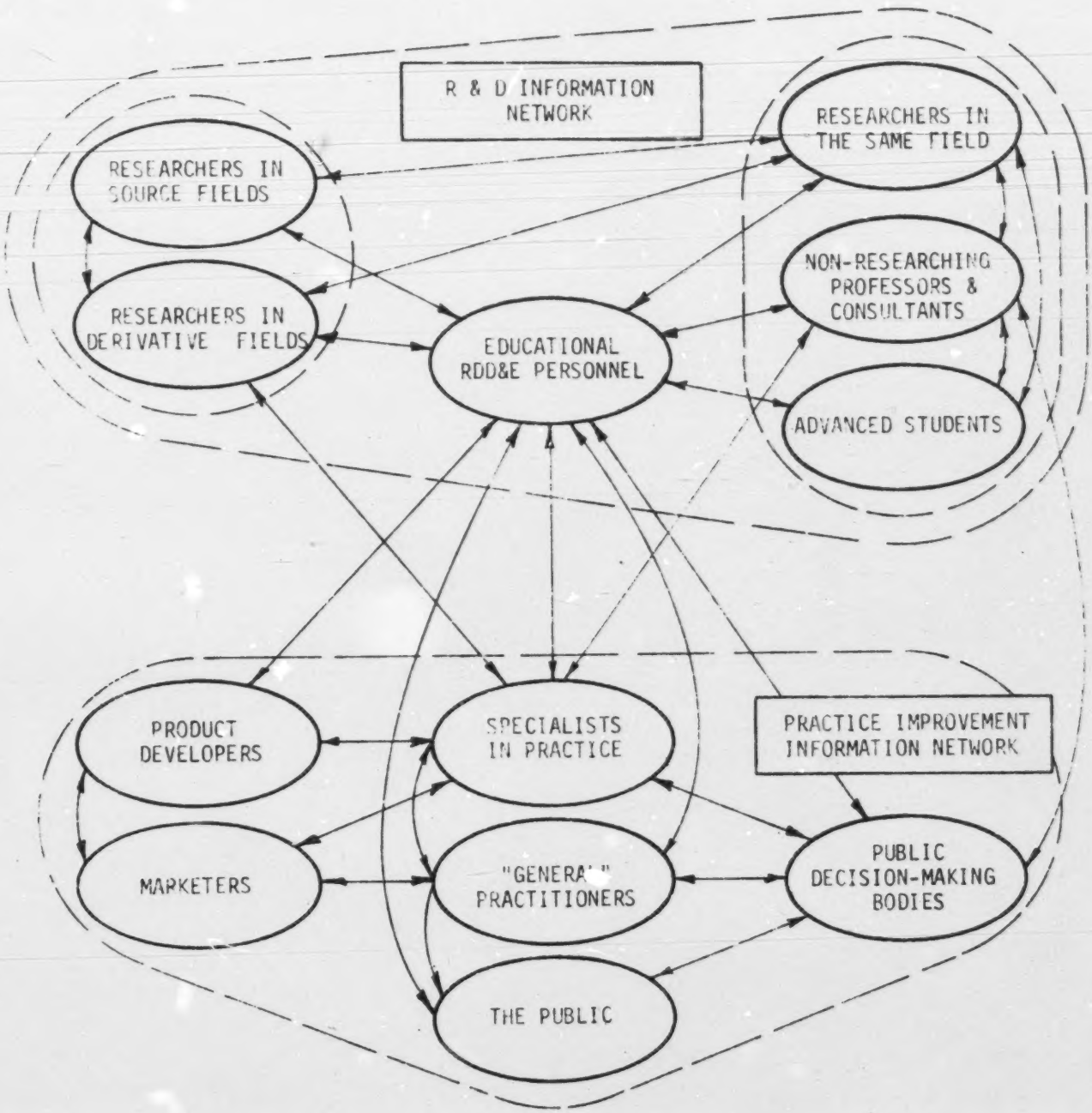
DISCIPLINED vs. EXPERIENTIAL KNOWLEDGE PRODUCTION BASE

GENERAL vs. SPECIFIC USER "TARGET"

"COMPLEXITY" vs. "SIMPLICITY" OF INNOVATIONS

FIGURE 2

HORIZONTAL AND VERTICAL KNOWLEDGE TRANSFER IN EDUCATION



administrators and practitioners of various kinds. Further removed from either research or practice but still conversant about issues and problems are the public decision bodies. At the end of the line is the general public, very remote from new knowledge, whether research or practice based, that will affect them in many ways.

In this figure I have outlined two major information networks--R&D and Practice Improvement. Typically the members of these two networks take understandably different positions on my next two dimensions.

[RETURN TO FIGURE 1]

The R&D network is committed to disciplined inquiry as its preferred mode of knowledge production and utilization, whereas the practice network must live in a far more complex, concrete, time- and event-bound, political and social environment where "experience," based on art, intuition, judgment, and memory of costly mistakes, is in fact often a more practical and safer guide to action.

In the R&D domain we strive for generalizations; we design our products for use in many target user systems. By contrast, the practitioner, usually functioning in only <u>one</u> target system, is concerned with a far more specific situation, with a quite particular configuration of needs, objectives, resources, constraints, and almost always with an on-going operation. Change, if complex, must usually be incremental and, if simple, must not "rock the boat" of other on-going activities.

I have put "complexity" and "simplicity" in quotes to acknowledge that the reference is to manifold characteristics of an innovation itself <u>or</u> of the implications of an innovation in terms of our capacity to communicate about, transfer, or install and maintain it; for instance, such characteristics might include size, cost, novelty, divisibility. Generally, the more complex an innovation is

(or seems), the more difficult it will be to diffuse and install it successfully. Our inability to classify the character of innovations or developments in ways that relate to user system characteristics or to diffusion processes is a problem that deserves more attention. Doug has offered us categories; I want to look at relationships among these categories.

Let's begin by focusing on the character of change efforts in the user system.

[SHOW FIGURE 3]

To be consistent with Doug's paper, I want to recognize that the environment of the user organization may be the target for change--but usually that target is the organization itself, groups of persons, or individuals within the organization.

When we analyze industrial organizations we can view them as complex systems in which at least four interacting variables are highly significant: task variables, structural variables, technolcgical variables, and human variables. However, in education, task variables and structural variables tend to be so closely related that they can be treated as one set. We can thus categorize the major applied approaches to organizational change in terms of three kinds of approaches [SHOW FIGURE 4]: organizational (combining task and structural variables), technological, and personnel.

Now in theory we can attempt to achieve change by employing a pure form of just one of these three approaches: e.g., change communications, systems of authority, or work flow as an organizational (structural) approach; change the tools and techniques, the machines and programs to achieve a technological approach; or change the values, attitudes, knowledge, skills, or behaviors of people to achieve a personnel approach. In practice, any approach must represent

FIGURE 3

TARGETS OF CHANGE

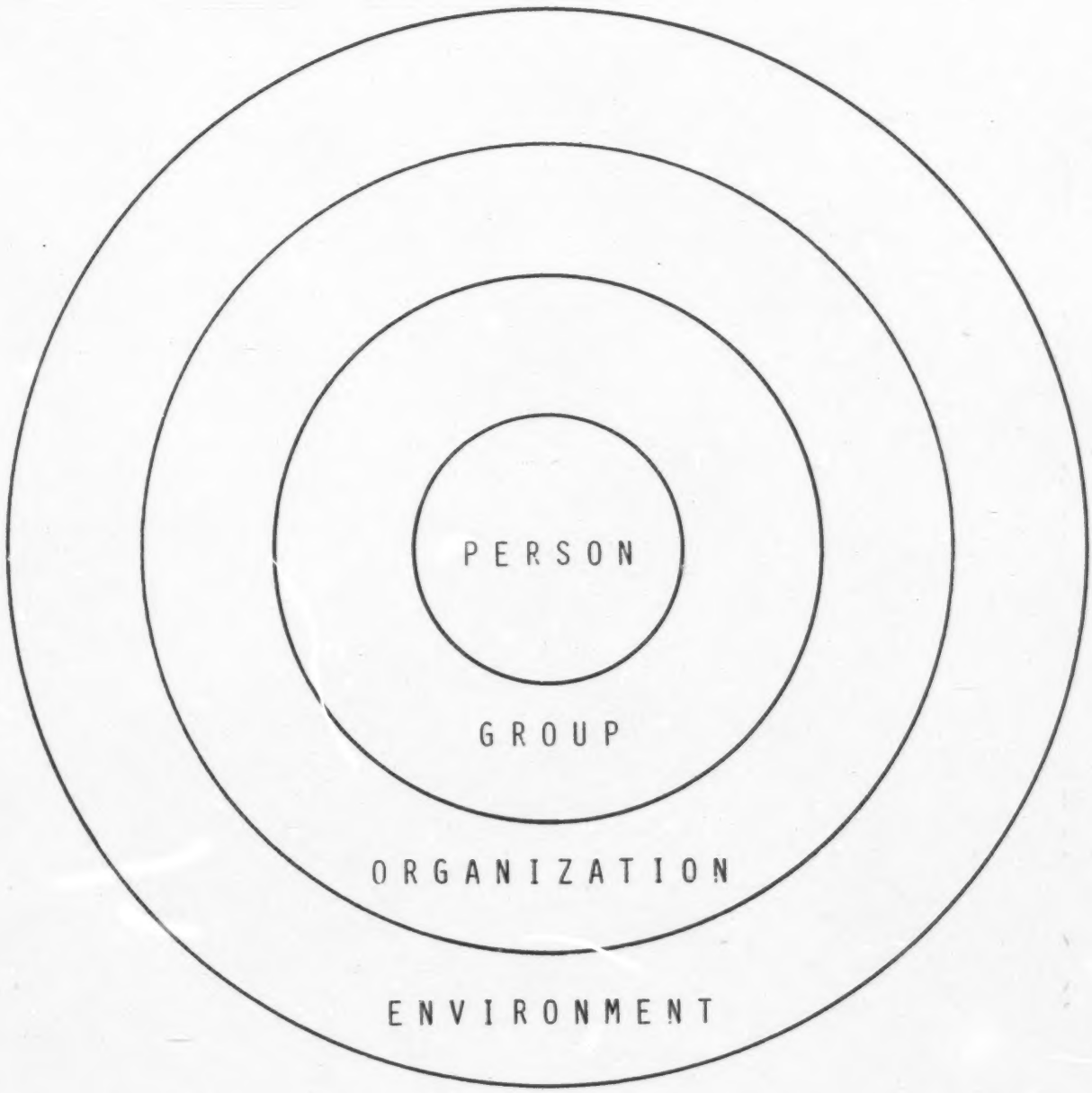
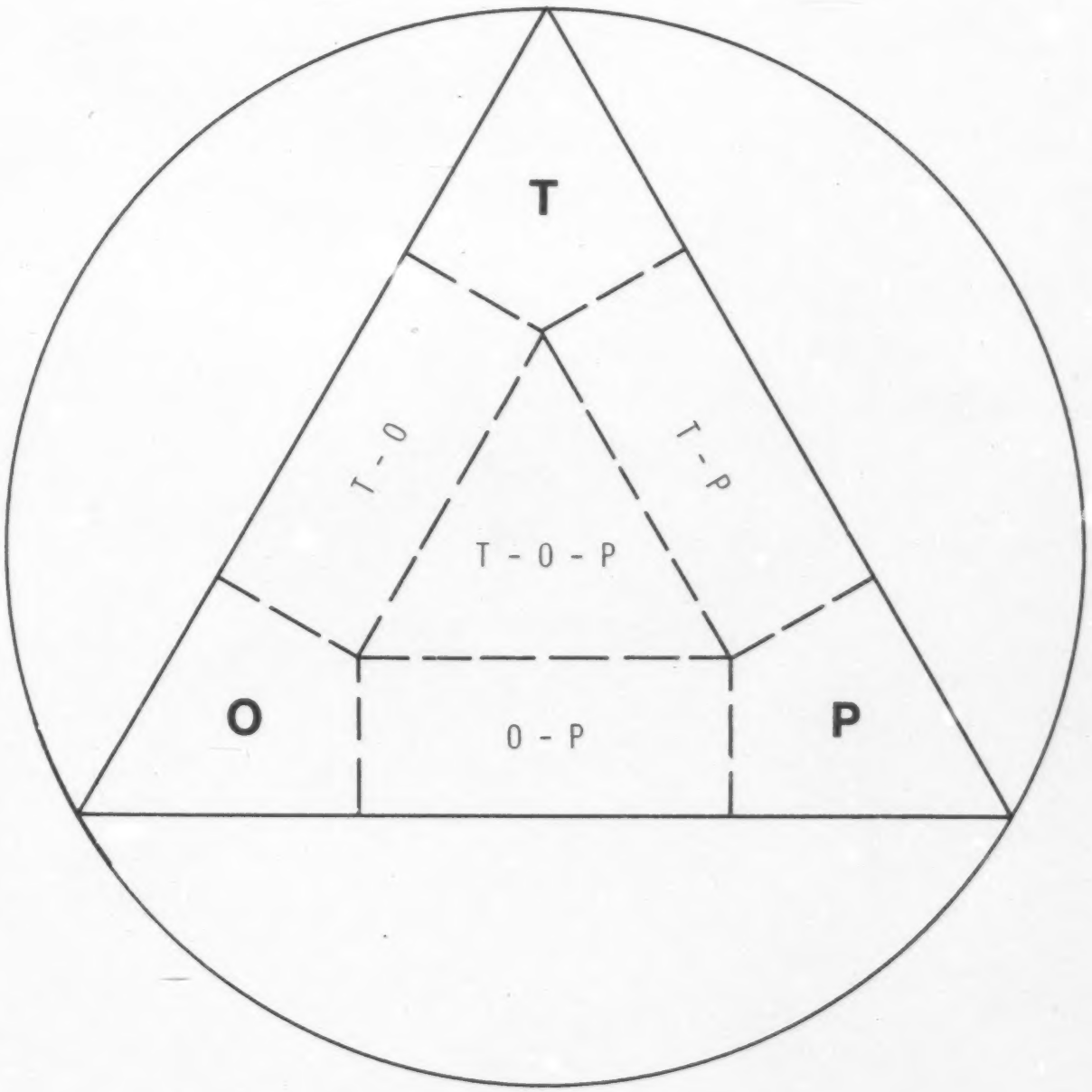


FIGURE 4

CHARACTERISTICS OF (USER SYSTEMS) CHANGE APPROACHES



some mix of all three in terms of what actually is to be changed. So change efforts can be "mapped" somewhere within the boundaries of this triangle, depending upon the relative emphases of approach.*

If we shift our terminology slightly [FIGURE 5] by replacing "approach" with "development," some of us may encounter a more familiar terminology. We could proceed much further in analyzing the similarities and differences among these many different developmental approaches; however, my purpose is much simpler. I want to note that when we are comparing educational developments or innovations, we need to know where they are "located" in terms of their mix of technological, organizational, and personnel characteristics.

At this point let's note that we can easily relate this scheme to Doug Paul's framework [PAUL'S FIGURE 3] by noting that we have focused only on the user system,

[SHOW--MODIFIED FIGURE]

and that we have relabeled one of Doug's three characteristics. I've replaced his label "innovation" with "technology" because any development, new to the user, whether it be technolgical, organizational, or personnel in character, can be considered an innovation.

But what are we going to do with Doug's five processes? I had a hard time mapping these to my triangle (as long as I focused solely on user systems) but in the effort I came up with some other change processes or methods that seem familiar.

[FIGURE 6]

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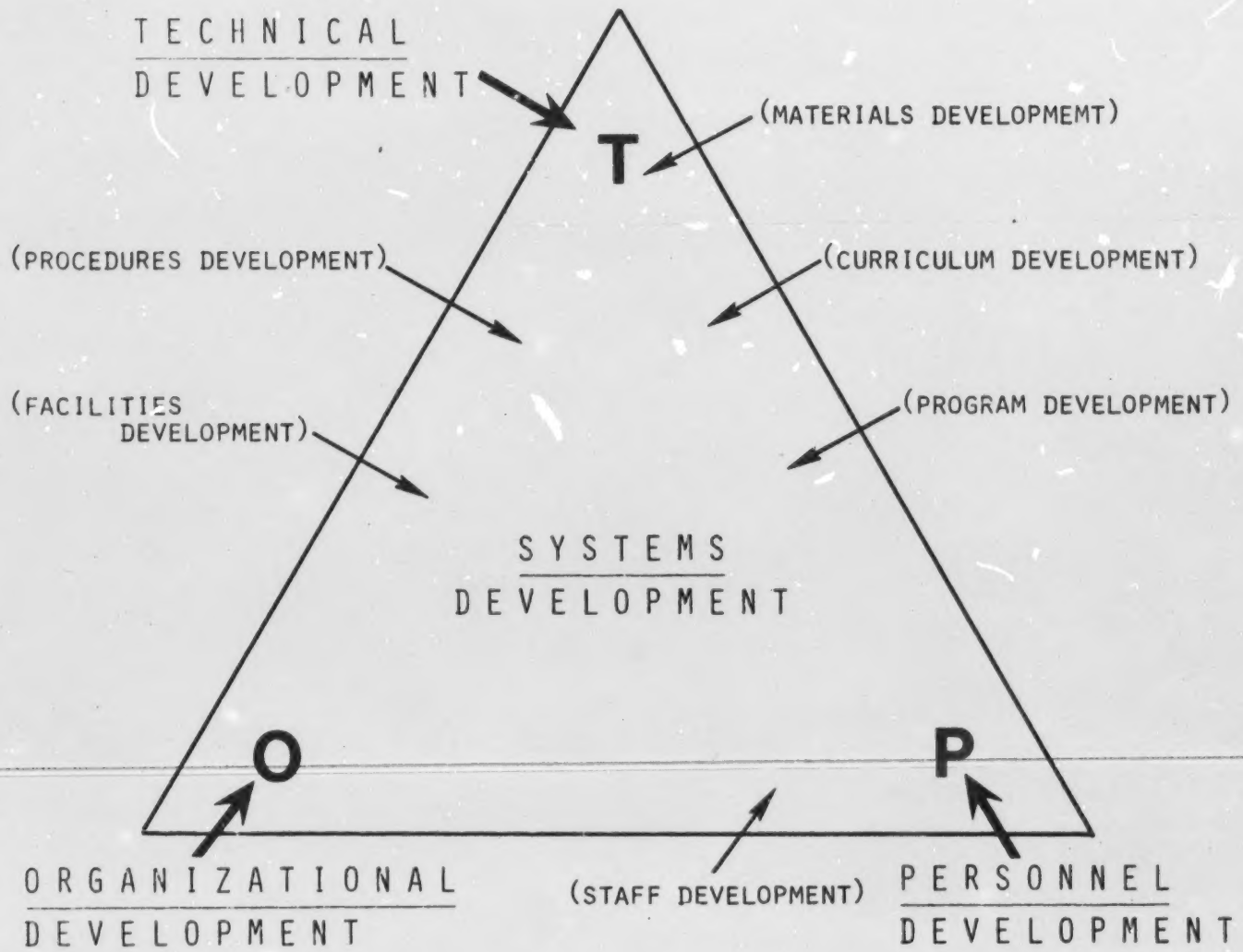
*I've drawn some dotted line sectors for those who would like to "pigeon hole" change efforts rather than conceptualize them in what should be a non-metric three-dimensional space. The three dimensions have been "projected" onto a plane in Figure 5 because in a few minutes I want to introduce visually a fourth dimension.

FIGURE 5

USER SYSTEM DEVELOPMENT APPROACHES



MODIFIED FIGURE

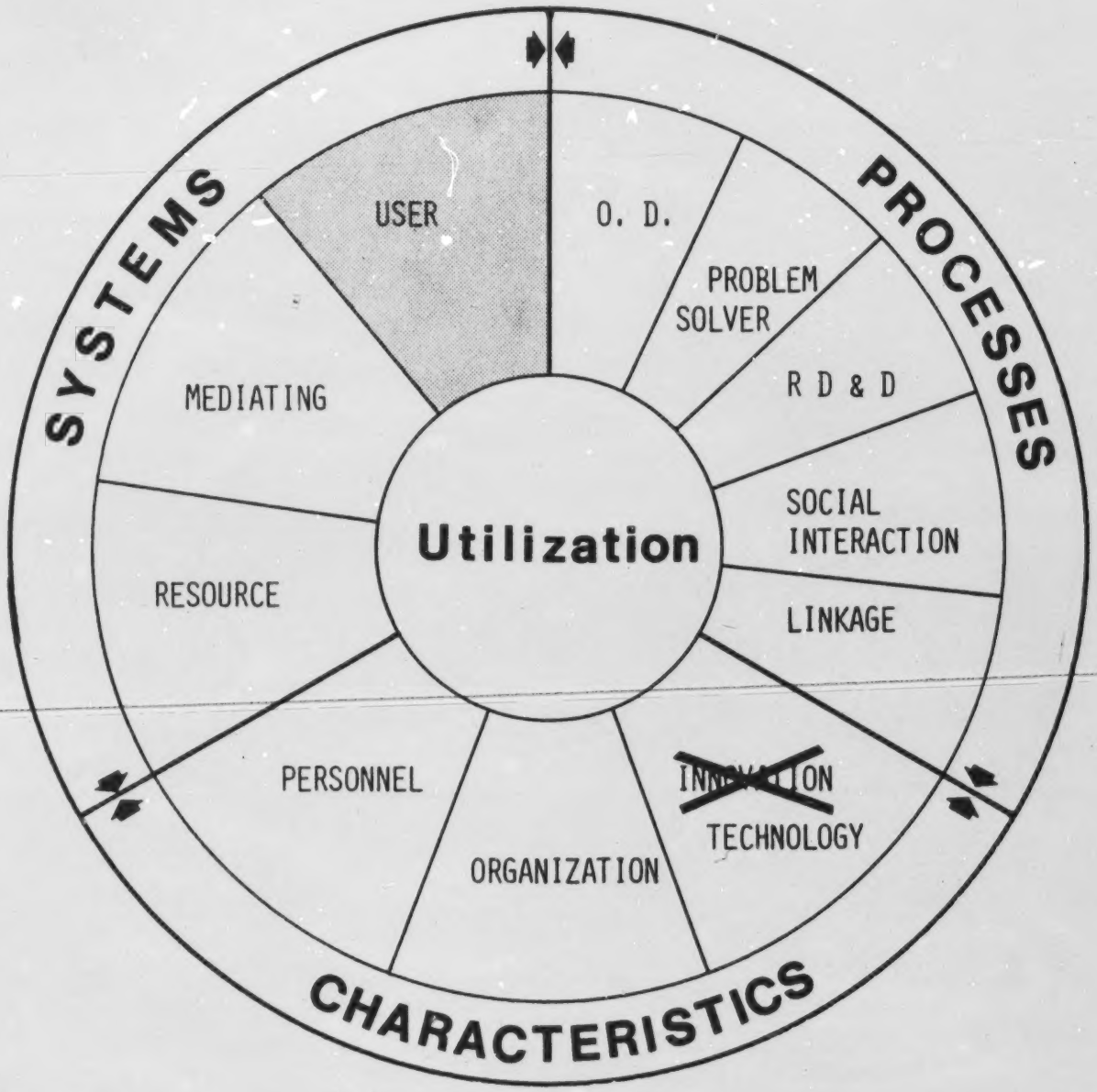


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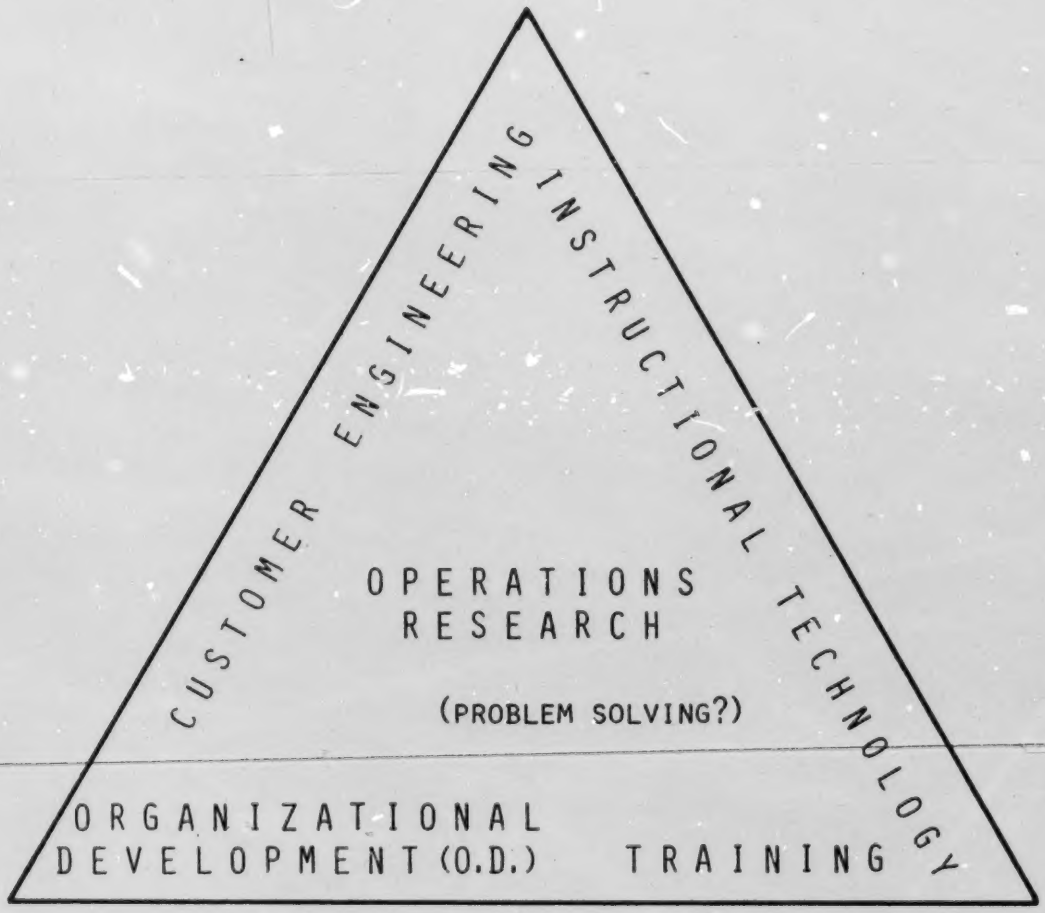
FIGURE 6

CHANGE METHODS FOR USER SYSTEMS



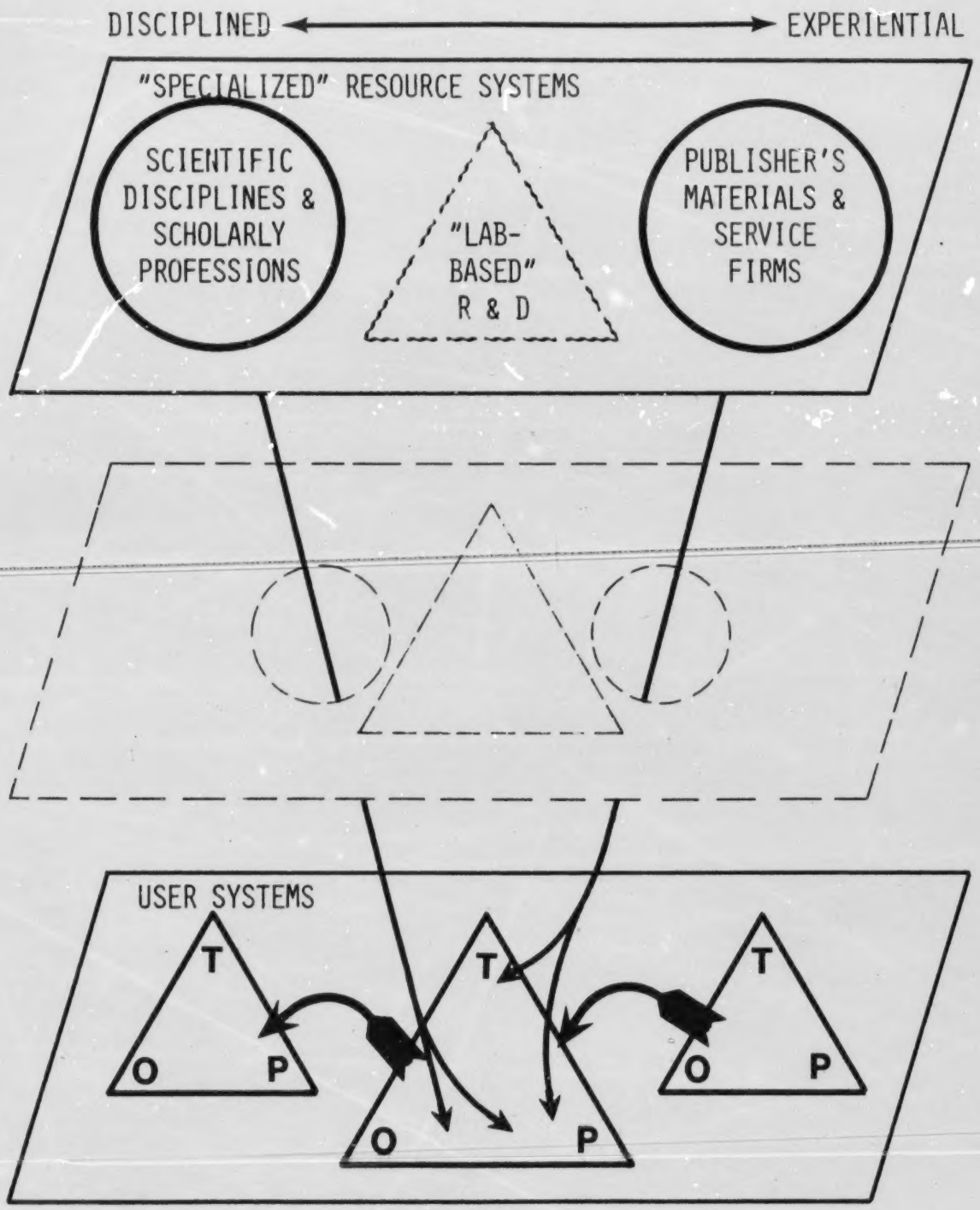
OD (that is, Organizational Development as a method) surely fits and is primarily associated with one side and end of the triangle since much of the OD effort in education focuses on interpersonal structures.

There may be a place for the problem solving process (using Havelock's definition) but there is an ambiguity about its location. I see no reason why this process is not relevant to the entire triangle, but as it's usually described and typically practiced the focus has been on helping one person or a small group within the organization. Recently educational practice has encountered a more specific, highly quantitative type of problem-solving approach--Operations Research (OR). In my view, OR belongs more nearly in the center of the triangle, because the OR specialist will usually entertain any method (technical, organizational, or personnel) for improving an operation. Obviously, training has been a long-used approach for attempting to change the behavior of people. Since much of the technology in education relates to curriculum and instructional resources, we find curriculum and AV specialists contributing to a process that has come to be labeled instructional technology. It tends to lean toward the personnel side of the triangle. When we are dealing with other technologies, e.g., computer installations, we may encounter a customer engineer or "technical representative" who assists user system personnel in installing hardware, trains them in operations and maintenance, and may assist in selecting, adapting, or developing software or procedures customized to user operations and requirements.

Significantly I really don't find a proper place for the RD&D process at this level; although the social interaction process must exist <u>within</u> the user organization, that's not its only location. So let's take a bird's-eye view of an additional organizational level [FIGURE 7] to see if we can begin to find these other processes. Here we have introduced the Resource System. There are several

FIGURE 7

RELATION OF ORGANIZATIONAL LEVELS
CHANGE CHARACTERISTICS & DIFFUSION PROCESSES



17

possibly pertinent comments to be made about this figure. First, I have introduced three system "triangles" at the user system level. My point is that a significant number of truly useful (but not necessarily research-based or validated) innovations in education result from essentially horizontal transfers. Operating systems must typically draw from and contribute to each other. It is my judgment that, despite superficial similarities, these horizontal transfers are quite different from vertical transfers. Once we acknowledge this fact, it is immediately apparent that it may be useful to distinguish several levels of resource systems and that we are confronted with the possibility, depending on your choice of constructs and definitions, that user systems are also resource systems. To avoid this confusion, I've labeled this second plane "specialized resource systems."

Note that I've oriented these specialized resources along the disciplined inquiry vs. experiential dimension with respect to their use of knowledge bases. Three somewhat different kinds of resources are located here. I have introduced the symbolism of circles and triangles and heavy and light borders to suggest some differences among them. I have heavily outlined the circles representing disciplinary research and representing publishers and other firms to suggest that they are relatively well established as resources for the educational practitioner, but the outline for "lab-based" R&D is substantially lighter, representing it as a relatively less well-established resource. (Note also that I have used the term Laboratory-based R&D to distinguish it from Field- or Practice-Based R&D, since essentially any of the kinds of developments at the user-system level can be (but usually aren't) highly disciplined and systematic.

I have chosen circles for two of the resource types in an attempt to suggest that the resources so identified typically communicate or deliver only "components"

for use within the user system. What tends to distinguish "lab-based" R and D is its effort to develop more comprehensive and articulated sets of resources.* To do so, lab-based designers, developers, evaluators, and disseminators must develop some form of a "model" of the salient features of the class or classes of operating systems they intend to use as "targets." And they must decide what kinds of developmental objectives and strategies they will employ. However, the lab-based developer's model is an abstraction--and may, in fact, be subject to severe distortions because of imperfect understanding or misconceptions of the structure and dynamics of user systems. I have used a light broken line to try to suggest this notion.

Needless to say, these models may be mapped on the same set of basic change characteristics with respect to their mix of organizational, personnel, or technological emphases. Hence I have depicted them in the triangular "image" of the user system.

If the programs, products, or processes that emerge as the end products of lab-based R&D are sufficiently simple as ideas or salable as products or services, there may be no acute problem in communicating or delivering them to users, since they may flow through the channels (depicted by the downward arrows) already established by older resource entities (disciplinary research and publishers).

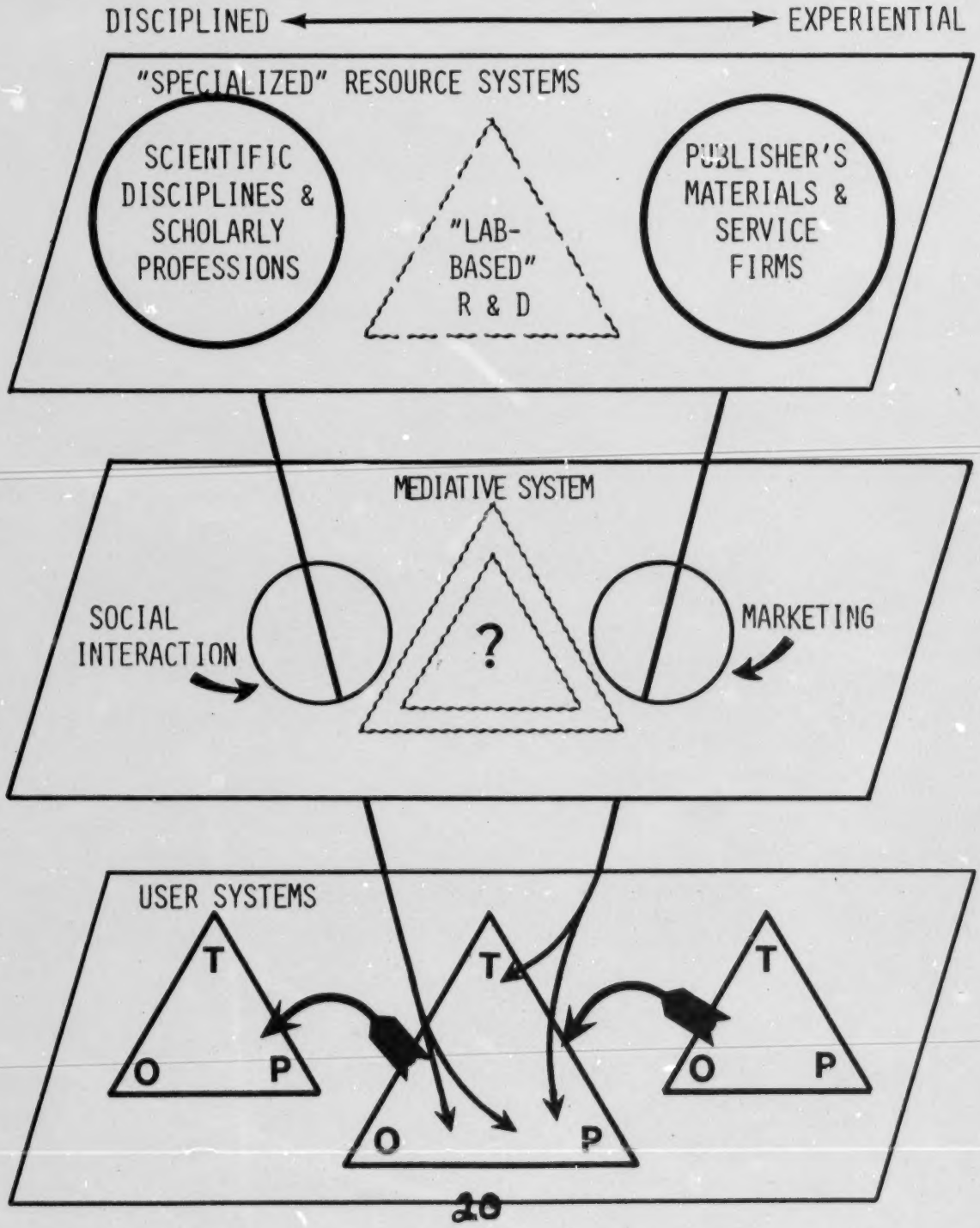
Unfortunately, many of the lab-based R&D products aren't that simple or salable. And so now we are literally inventing a whole new set of mediating mechanisms

[FIGURE 8]

*Note please that "lab-based R&D" should not be associated solely with R&D Centers or Regional Educational Laboratories. A variety of agencies located in the "resource system level" including commercial firms engage in "lab-based R&D."

FIGURE 8

RELATION OF ORGANIZATIONAL LEVELS
CHANGE CHARACTERISTICS & DIFFUSION PROCESSES



to help us create awareness and interest and to deliver the products and services required if these kinds of R&D products are to be successfully installed, serviced, and maintained in user systems.

Time does not permit extensive comment about the characteristics of this collection of mediating systems, but I would note that on the left-hand side we have the conventional knowledge transfer mechanisms--which are typically heavily dependent on translators (for instance, consultants, educational extension agents, educational writers) who through either word of mouth or practitioner-oriented print forms modify the vertical knowledge flows into more intelligible and directly applicable forms.

On the right side we find an array of commercial marketing mechanisms that have been developed largely by trial and error over many years for the promotion, sale, and delivery of the more conventional and profitable forms of educational products and services. As we have begun to encounter more complex forms of R&D products--whether lab-based or field-based--we are encountering comparable (but not identical problems) in devising effective, inexpensive methods for transferring them from their place of development to many operating systems. Certainly we are occasionally finding a substantial amount of "end-product development" (for instance, awareness products, training materials, installation packaging, redesign to reduce cost or increase attractiveness, and so on) that often occurs at the mediating system level.

Throughout this paper I have dealt primarily with communication, transfer, and utilization. But it may be worth commenting that knowledge (and technology) production is located in all systems levels and that there are many kinds of transfers--those within the confines of the specific user system itself or direct

horizontal or indirect vertical transfers from one user system to another, or transfers directly from specialized resource systems or indirectly through mediating systems that may, and typically must, modify the knowledge or technology they seek to transfer.

All these figures are, at best, an oversimplification, if not an exaggeration. The three systems levels blur into one another. Conclusion-oriented and decision-oriented disciplined inquiry and experience-based knowledge coexist in the same agencies, if not in the same heads. Moreover, we are in a highly dynamic field. By now we have virtually abandoned the simplistic and unrealistic "linear" model of RDD&E. We have also come to realize that significant educational RDD&E is far more difficult, costly, and risky than many of us would have imagined a decade ago. Despite these difficulties, the functions of RDD&E, including technical implementation assistance, are being undertaken by a great variety of educational organizations--whether school, university, state department, laboratory, or commerical publisher.

Given the newness of the effort and the many perspectives that persons may take, depending on where they are located, I am not surprised that we are still trying to sort out roles, relationships, and activities among producers, diffusers, and consumers. I am pleased that educational diffusion and knowledge utilization is finally becoming an area of significant concern. My major hope is that we can apply disciplined inquiry to this area. But if we are to do so, both the researcher and the practitioner need some kind of framework in order to identify and relate a highly diverse set of systems, innovations, and processes. What I have tried to do is to carry Doug Paul's framework for categorizing KPU research one step further by attempting to illustrate some of the major relationships among these categories.